TEL

RESEARCH AND DEVELOPMENT

29 OCTOBER 1980 (FOUO 11/80) 1 OF 1

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29 October 1980

Worldwide Report

TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT

(FOUO 11/80)

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CONTENTS

INTER-ASIAN AFFAIRS

JAPAN-PRC SATELLITE PHONE HOOKUP JAMMED BY THIRD COUNTRY

OW061255 Tokyo MAINICHI DAILY NEWS in English 4 Oct 80 p 12

[Text] International telephone communications via a communications satellite, linking Japan and China, were recently jammed by a mysterious radio wave, the Posts and Telecommunications Ministry has disclosed.

Ministry officials said this was the first time a satellite communication telephone service had been disrupted by an unidentified radio wave.

They said the incident, which affected the communication for some 30 minutes, occurred at a time when Japanese experts were investigating a recent cutoff of undersea cable lines between the two countries.

It is expected that experts from the two countries will discuss the matter and map out countermeasures in Shanghai shortly.

The officials disclosed that the telephone communication was jammed September 25 between 7.43 and 8.14 p.m. The jamming occurred one day after the undersea cable lines were found cut at a point off Kumamoto Prefecture.

A KDD monitoring station in Ibaraki Prefecture reported that it could not receive the communications for about 30 minutes because of jamming. The station was unable to find the exact source of the problem.

Japanese and Chinese telecommunications officials determined that a mysterious jamming was made by a third country.

Taking a serious view of the incident, the ministry has reported it to the Intelsat Operation Center in the United States for fear that telephone communications via the Intelsat satellite which is stationary over the Pacific would be jammed in the future.

On the other hand, undersea cables linking Japan and China have been cut off five times since the first incident was reported in 1978. The Japanese ministry has asked the Maritime Safety Agency to step up its patrol around the area where undersea calbes are laid.

CSO: 5500

JAPAN

SATELLITE SYSTEM FOR NEWS RELAY TO BE TESTED NEXT MARCH

OW041401 Tokyo THE DAILY YOMIURI in English 3 Oct 80 p 2

[Text] A newly developed satellite transmission system for newspaper use to be tested from next March would allow remote areas to get the same late-breaking news stories carried in late editions for large cities.

At the suggestion of the YOMIURI SHIMBUN, the planned experiments will be jointly undertaken by Nihon Shimbun Kyokai (The Japan Newspaper Publishers and Editors Association) and the Radio Research Laboratory of the Posts and Telecommunications Ministry.

The stationary communications satellite "Sakura," which the U.S. put into sationary orbit above the Equator in 1977 for Japan, will be used for the tests. Similar satellite transmission is already being used in the U.S.

The projected tests follow the recent development by the Radio Research Laboratory of an ultrasmall ground station for sending and receiving the transmission waves.

Named single channel per carrier (SCPC) system, the new ground station with capacity equivalent to a single telephone circuit is the smallest of its kind in the world. It is two meters high, one meter wide and weighs 450 kilograms. Unlike the large-capacity ground station as used for the U.S. transmission system, the SCPC with a one-meter-diameter parabolic antenna is movable aboard a truck, according to the research laboratory. In the planned experiments, an SCPC will be installed atop the Tokyo headquarters building of the YOMIURI SHIMBUN.

The NIHON KEIZAI SHIMBUN will transmit signals for reproduction of news items, and "Sakura" will relay the signals to the SCPC via the radio research laboratory's Kashima station in Ibaraki-ken.

CSO: 5500

JAPAN

BRIEFS

'JIJI' IN SEOUL--Tokyo, Oct 8 (JIJI PRESS)--JIJI PRESS, a leading Japanese news agency, resumed news gathering in Seoul Wednesday upon receiving the South Korean authorities' permission. On Wednesday, JIJI PRESS correspondent Katsumi Murotani returned to Seoul for the first time in about three months since it was ordered to shut down its Seoul bureau along with two other Japanese news organizations last July 3. [Text] [OW081333 Tokyo JIJI in English 1245 GMT 8 Oct 80]

CSO: 5500

USSR

TELEGRAPH AND FACIMILE COMMUNICATIONS AT THE 1980 OLYMPICS

Moscow ELEKTROSVYAZ' in Russian No 7, 1980 pp 1-3

[Article by N. M. Korsakov]

[Text] At the 1980 Olympics, important significance has been attached to the document forms of communication -- telegraph and facimile -- permitting relatively high reliability of the transmitted information to be obtained.

In accordance with the organizational scheme for the Olympics communications developed by the Giprosvyaz' Institute [1-3], a station for information gathering and processing at the USSR Central Telegraph Office, teletype machines at the Main Press Center (G.P.Ts) and 25 subpresscenters at the Olympics sports facilities have been built. One of the Olympic sites -- the new Central Telegraph building -- is shown in Figure 1 [not included].

At the GPTs center and the suppress centers, foreign correspondents and also representatives of foreign television and radio companies will be able to transmit information to their addressees over the Teleks [Telex] network using teletype machines installed in the equipment rooms. The access of the teletype to the international Telex network will be through the new international electronic switching office installed at the Central Telegraph Office of the USSR especially for the Olympic Games. The machines included in the Moscow Automatic Office were installed for correspondents working with the intra-Soviet subscriber telegraph network.

In order to accelerate the transmission and decrease the time that the telegraph channel is busy, the information must first be punched. For this purpose provision is made for special equipment in the teletype rooms. The punching, setting up the addressee number and transmission of the prepared information on the punchtape can be done by the correspondents independently, or all of these operations will be performed by the Central Telegraph personnel with payment for the operations by the correspondent in accordance with the established rate.

For servicing of the correspondents at the 1980 Olympics broad use has been made of facimile communications. The high-speed Infotek-6000 equipment (built by the Federal Republic of Germany) is used to connect the GPTs

Center and the subpress centers to the foreign offices equipped with analogous equipment. This connection is made by the long distance patch through the international telephone office and the rayon crossbar-type automatic office which includes the Infotek-6000 telephone equipment. All of the data transmission operations on the Infotek-6000 equipment are performed by the Central Telegraph employees.

For processing the excess volume of information from the press centers when it cannot be transmitted at once to the destination equipment of the Telex and Infotek-6000 equipment, there is a Data Gathering and Processing Office (Figures 2, 3 [not reproduced]). The excess information from the press centers transmitted to the office using the Infotek-6000 equipment is punched on the telegraph equipment and then transmitted to the destination office over the Telex network or over the direct international telegraph communications.

The largest volume of telegraph equipment is concentrated at the GPTs and at the Information Gathering and Processing Office. Some 95 and 88 teletypes connected to the Telex network and 42 and 32 pieces of Infotek-6000 equipment are installed there, respectively. At the Information Gathering and Processing Office 150 telegraph machines are used for punching information received from the GPTs and the subpress centers.

Ten teletypes from the Telex network and 14 Infotek-6000 sets are connected to the teletype rooms of the five subpress centers in the Luzhniki sports complex. The largest subpress center at Luzhniki has been organized in the Great Sports Arena; there are 5 teletypes and 6 Infotek-6000 sets here. Eight Telex teletypes and 6 Infotek-6000 sets have been installed at the two subpress centers of the sports complex on Mir Prospekt, including 5 and 3 at the subpress center of the Olimpiyskiy [Olympic] Stadium, respectively. At the three subpress centers of the sports complex in Krylatskiy there are 4 Telex teletypes and 7 Infotek-6000 sets, including 2 and 3, respectively, at the Grebnoy channel subpress center. At the remaining subpress centers there are one or two Telex teletypes and two Infotek-6000 sets each.

The Telex teletypes are connected to the international electronic AKhV-20 switching office of the Eriksson Company (Sweden) telegraph channels organized with the help of the TVU-12 equipment (installed at the GPTs center) and the DATA-3PO and DATA-6PO equipment (at the subpress centers). The Infotek-6000 equipment at the GPTs center and the subpress centers is connected to the Infotek-6000 equipment at the Information Gathering and Processing Office by the direct lines of the city telephone exchange trunks. A large bunch of telegraph channels has been organized between the Central Telegraph and the Olympics television and radio complex buildings where the Telex network equipment is located; direct telegraph channels have been organized for foreign television and radio rooms under lease agreements.

The T-100 teletype machines built in Czechoslovakia are being used in the Main Press Center and the subpress centers of the 1980 Olympics for punching and transmitting information over the Telex network. They are made in the two-register version (Roman characters and numbers), and they operate at a speed of 50 baud. The T-100 teletype has a builtin punchtape transmission device (transmitter) and punch and also a ringing set.

The new RTA-80 Soviet-made electronic teletypes are being used to transmit information over the subscriber telegraph network inside the country. The equipment can be operated at speeds of 50 and 100 baud. The speeds are switched by pressing one key. The teletype has a photoreader, punch and builtin ringing set permitting a number to be dialed directly from the keyboard.

The Infotek-6000 facimile equipment insures high-speed transmission of line originals over the voice-frequency channel. The technical specifications for the equipment are as follows: scanning procedures -- planar; recording -- electrostatic; transmission -- phase-amplitude modulation over the voice-frequency channel with 1800 hertz carrier; transmission time of one sheet (format A-4) and frame resolution during operation in the following modes:

Express -- 35 seconds, 2.7 lines/mm; Standard -- 1 minute, 4 lines/mm; Detail -- 2 minutes, 8 lines/mm; line resolution -- 8 lines/mm.

The TVU-12 equipment is designed for transmission of both start-stop and synchronous signals of any code with a telegraph speed of up to 200 baud. The equipment uses the principle of time sharing of the channels with pulse-amplitude keying of the signals in the individual telegraph channels; 12 two-way telegraph channels operate on one four-wire physical network each. The distortions introduced by the equipment do not exceed 3% at a speed of 50 baud and 6% at a speed of 200 baud. The direct range of communications is 6 to 12 km.

The DATA equipment -- the duplex subscriber telegraph -- is designed for operation over the two-wire GTS [city telephone exchange] physical cable circuits. The equipment has two versions -- DATA-3 and DATA-6 -- and it provides for the organization of three or six telegraph channels respectively. The principle of time sharing of the channels with pulse-code modulation of the signals in individual channels is used. The group transmission rate over the GTS line is 2400 baud (DATA-3) and 4800 baud (DATA-6). The direct communication range with the DATA-3 equipment is 18 km, and with DATA-6, 13 km. The degree of isochronous distortions introduced by the DATA channels at a speed of 50 baud is no more than 4%, and at a speed of 100 and 200 baud, no more than 7%.

The Telex teletypes of all Olympic sites are connected to the AKhV-20 international electronic switching office. All of the subscribers of the Telex network with a step-by-step system International Telegraph Office operating up to now are also connected to it. The electronic office has a capacity of 2000 numbers and is designed to process the telegraph traffic of the Telex network and the general-use Genteks [Gentex] international network (data transmission rate 50 baud, MTK-2 code). The office equipment provides for automatic processing of all of the outgoing, incoming and through international traffic of the Telex and Gentex networks and also semiautomatic and manual processing of the international traffic with the subscribers of the countries having no automatic communications channels.

In addition to ordinary two-way connections, the office can provide the subscribers with a number of additional services (automatic multiaddress transmission, circular communications, direct bringing, abbreviated dialing with numbers, and so on), and it also permits servicing of up to 100 categories of subscribers. It outputs telegraph service signals for current time and duration of establishment of connections. The AKhV-20 office interacts with other offices and subscribers having type A, B/T, B/D, C and D signalling in accordance with the ITTCC recommendations.

The technical maintenance of the office has been automated to the maximum, constant monitoring of the technical condition of the equipment, channels and subscriber lines has been provided with recording and output of information on the location and nature of possible failures, and information on the cost of the calls, statistical data required for international calculations and performance of technical maintenance are gathered and output.

Many of the collectives of the enterprises and organizations in the capital providing for timely and high-quality installation, assembly and adjustment of the complicated sets of process equipment, machines and instruments participated in the preparation of the telegraph and facimile communications media for the Olympic Games. A great deal of work was also done by the communications specialists of Estonia, Kiev, Leningrad and Minsk.

It is possible to state that the large army of correspondents and visitors at the 1980 Olympic Games will be satisfied with the operation of the communications facilities.

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USSR

UDC 621.376.56

EQUIPMENT FOR DIGITAL TRANSMISSION OF SOUND BROADCAST SIGNALS

Moscow ELEKTROSVYAZ' in Russian No 7, 1980 pp 4-9

[Article by A. N. Golubev, I. M. Dvoretskiy, I. N. Driatskiy, Yu. P. Ivanov, L. S. Levin]

[Text] The equipment for digital transmission of sound broadcast signals (ATsV) is designed for the organization of large bunches of sound broadcast trunks on the intra-city segments of the network. The sound broadcast equipment operates on the line channels of the primary digital systems (IKM-30) with a data transmission rate of 2048 kbits/second.

Up to 8 sound broadcast channels, each in a frequency band of 50 to 6400 hertz -- can be organized with respect to the first channel. During the VII Spartakiad Games of the Peoples of the USSR in Moscow there were 120 sound broadcast channels in operation organized by means of this equipment. By the time of holding the Olympic Games the number of ATsV channels between the sports complexes and the Olympics Switching Center (OKTs) reached 600. The volume of equipment recalculated for standard bays with overall dimensions of 2600 × 600 × 225 mm is 55 bays.

For comparison let us point out that when using the AB-2/3 equipment for these purposes more than 1000 standard bays would be required, and when using the cable and radio relay broadcast line (UKRLV) equipment, about 400 bays. The use of the trunk bays (SSL) requires laying of an expensive type TDS cable; in addition, the length of communications is limited to 17 km at the same time as the ATsV permits transmission of information more than 50 km over low-frequency telephone cable pairs with paper insulation, type T, TZ, TPP, and so on.

The ATsV is the only sound broadcast signal transmission equipment not requiring adjustment and tuning either when putting it into operation or during operation and maintenance.

Composition of the ATsV Equipment. The ATsV equipment includes the following:

A digital broadcast complex (KTsV) which, in turn, includes a two-row coding complex (KKV) and a two-row decoding complex (KDV). Each KKV row is designed for analog-to-digital conversion of two analog sound information broadcast signals to a digital flow at the rate of 512 kbits/sec. Each KDV row performs the inverse conversion of one digital flow at a rate of 512 kbits/sec into two analog information broadcast signals;

The primary temporary group-formation complex (KPVG) designed for synchronous and cophasal combination (separation) of four digital flows with a transmission rate of 512 kbits/sec into a digital flow with a rate of 2048 kbits/sec and for joining the IKM-30 equipment for joining to the terminal equipment of the line channel (OLT);

The digital broadcast channel frame (SKTsV) containing the service panel (PO) designed for automatic monitoring, display and signalling of the basic equipment failures, organization of the service communications and measurement of the quasipeak level of the sound broadcast signals and the KKV inputs and the KDV outputs. Up to 3 KPVG complexes and 6 KKV complexes can be installed on the transmitting side on the SKTsV frame (see Figure 1), and up to 3 KPVG and 6 KKV on the receiving side. When placing one KPVG complex and two KKV on the frame, the formation of one flow with a speed of 2048 kbits/sec is insured;

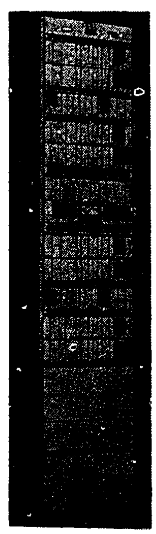

Figure 1.

The instrument for measuring the signal/noise quantization ratio in the dynamic range of input signals from +6 dBm0 to -60 dBm0.

The diagram of the organization of communications using the ATsV is presented in Figure 2.

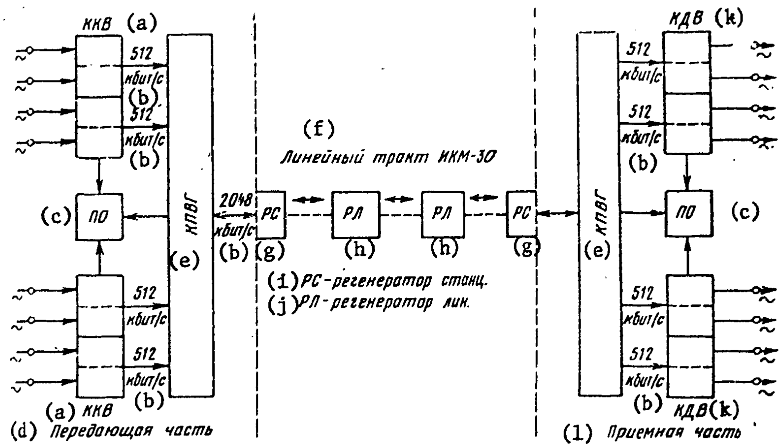

Figure 2.

Key:
- a. KKV
- b. kbits/sec
- c. PO
- d. transmitting part
- e. KPVG
- f. IKM-30 line channel
- g. RS
- h. RL
- i. RS — station generator
- j. RL -- line generator
- k. KDV
- l. receiving part

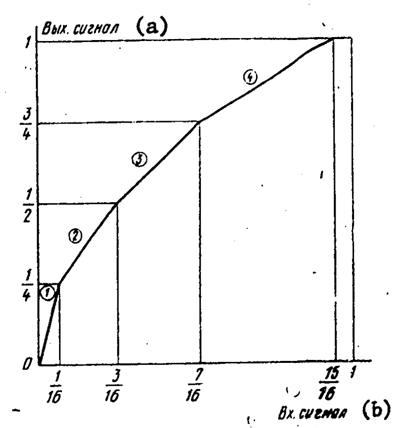

Figure 3.

Key: a. output signal b. input signal

Structural Principle of the Equipment. The digital broadcast equipment is based on using the principle of pulse-code modulation and time sharing of the channels. The formation of the group digital flow of 2048 kbits/sec corresponding to 8 information broadcast channels is realized by the combined method: combination at the input of each of four analog to digital converters of two readings corresponding to two analog signals and following with a frequency of 16 kilohertz each, and symbol-by-symbol combination of four synchronous digital flows with a speed of 512 kbits/sec formed at the outputs of these converters.

In the equipment nonuniform quantization of the analog signals is used in accordance with the piecewise-linear companding characteristic type μ = 15/7 presented in Figure 3 (15 -- value of the compression parameter, and 7 -- number of approximating segments). In the case of nonlinear 12-bit coding this characteristic insures a noise power in the silence mode and a signal/noise quantization ratio corresponding to the requirements on the higher-class sound broadcast channel.

In order to increase the protection of the digital signal from interference in the line channel at the output of each analog-to-digital converter, the higher-order and lower-order bits are rearranged in the code groups, and parity of the six higher-order bits is checked. These operations permit an increase in protection of the digital signal by no less than three orders.

The group digital flow with a speed of 2048 kbits/sec at the KPVG output is converted from binary code to AMI code or to HDB-3 code.

In the receiving part of the equipment, inverse conversion of the quasiternary code to bindary and separation of the digital flow of 2048 kbits/sec into component flows of 512 kbits/sec each are realized. Each of these flows is converted in the decoding complexes to two initial analog signals.

The tranmission cycle (Ts) contains 64 pulse positions. The cycle time is 31.25 microseconds. The use of the positions in the transmission cycle is explained in Table 1. The information of the eight sound broadcast channels and the service information symbols are transmitted in two subcycles Ts0 and Ts1. In positions 1-4 of sybcycle Ts0 the cyclic synchronization signal is transmitted which is in the form of alternating sequences of bunches of zeros (0000) and ones (1111). In positions 5-52 the information symbols of the broadcast channels are transmitted. Positions 53-56 are used to protect the information symbols from interference in the line channel, and position 57-60 for transmission of the signals for monitoring the condition of the analog to digital converters KTsV.

The service communications, signal and emergency broadcast signals are transmitted on positions 1-4 in the subcycle Ts1. Positions 61-64 of the transmission cycle are free.

Table 1

Type of transmitted information	Numbers of positions in subcycle	Numbers of subcycles in cycle
Synchronous signals	1-4	Ts0
Symbols of first flow:		
a) information	5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49.	Ts0 and Ts1
b) service	53, 57	Ts0 and Ts1
Second flow symbols:		
a) information	6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46, 50.	Ts0 and Ts1
b) service	54, 58.	Ts0 and Ts1
Third flow symbols:		
a) information	7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51.	Ts0 and Ts1
b) service	55, 59	Ts0 and Ts1
Fourth flow symbols:		
a) information	8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52.	Ts0 and Ts1
b) service	56, 60	Ts0 and Ts1
c) free	61-64	Ts0 and Ts1
Digital service communications	1, 2	Ts1
Call signal	3	Ts1
"Notification" signal	4	Ts1

Let us consider the peculiarities of the operation of each complex entering into the ATsV in more detail.

KTsV Digital Broadcast Complex. The KTsV digital broadcast complex, the structural diagram of which is depicted in Figure 4, is designed for analog-to-digital conversion of the analog sound broadcast input signals on the transmitting side and the inverse conversion of the receiving side. The KTsV (Figure 5) consists of two complexes: the two-row coding complex on the transmitting side (at the bottom) and the two-row decoding complex on the receiving side. Each of these complexes is made in the form of a two-row cassette with overall dimensions of 540 × 260 × 225 mm. In each row there is equipment which converts two sound broadcast signals to one digital flow of 512 kbits/sec (the coding complex), inverse conversion of this digital flow and separation of it into the initial signals using the URS device.

Functionally the KTsV includes the following: the coder designed for analog-to-digital conversion on the transmitting side; the decoder designed

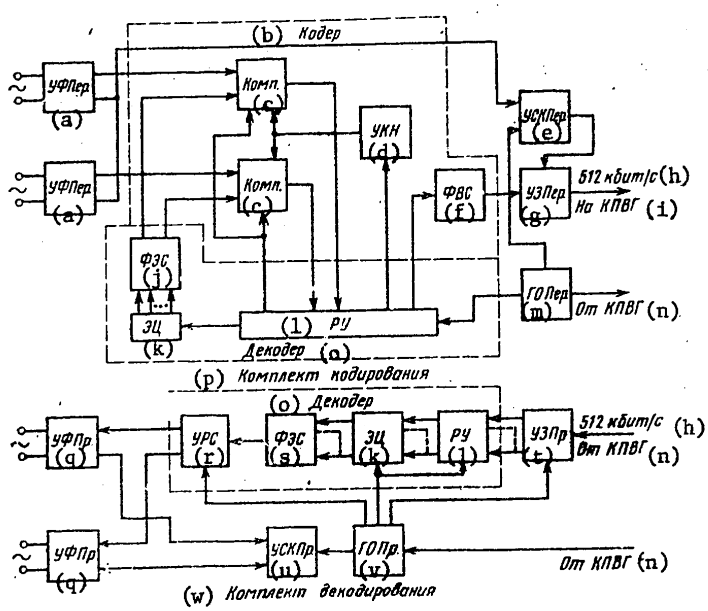

Figure 4.

Key:
- a. UFPer. [transmission filter]
- b. Coder
- c. Comp.
- d. UKN
- e. USKPer. [codec controller]
- f. FVS
- g. UZPer. [device for protection of the signal against interference in the digital line transmission channel]
- h. 512 kbits/sec
- i. to the KPVG
- j. FES
- k. ETs
- l. RU
- m. GOPer. [transmitting generator equipment]
- n. from the KPVG
- o. decoder
- p. coding complex
- q. UFPr. [receiving filter]
- r. URS
- s. FES
- t. UZPr. [device for protection of the signal against interference in the digital line receiving channel]
- u. USKPr. [receiving code monitor]
- v. GOPr. [receiving generator equipment]
- w. decoding complex

for digital-to-analog conversion on the receiving side; the transmission and reception filter UFPer and UFPr used to limit the spectrum of the analog signal; the device for protection of the signal from interference in the digital line channel UZPer and UZPr and also the codec controllers USKper and USKpr; the FVS output signal shaper.

The basic functional assembly of the equipment determining s ch channel parameters as the noise power in the silence mode, the signal/noise quantization ratio, and so on is the codec made up of the coder and decoder. The coder is constructed using the method of bit-by-bit balancing of the decoder in the feedback circuit. The digital signal at the coder output is a 12-bit symmetric digital code. The first symbol in the code group bears information about the polarity of the signal; the next two determine the number of the signal in the quantrant; the last nine symbols bear information about the quantization level number within the limits of the segment.

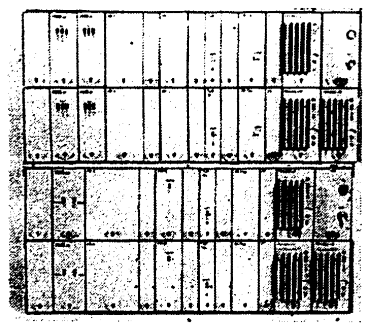

Figure 5.

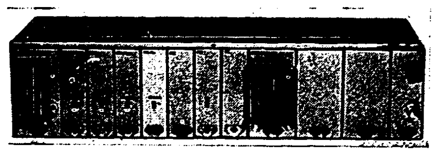

Figure 6.

An individual comparator Komp. is used in the coder for each analog signal. The FES standard signal shaper controlled by the signals from the digital expander ETs is common to both comparators. The FES is constructed using decoding eight-bit positive and negative matrices of the 252 PA-1 and 252 PA-2 type (seven bits of each matrix are used). For shaping the 14-bit standard signal two matrices are connected in series through a scaling operation amplifier. The FES jointly with the ETs and the control register RU are the decoder which is analogous to the one used in the receiving part of the equipment.

In order to eliminate the effect of the destabilizing factors on the position of the initial operating point, a "null" correction device UKN is used in the coder which insures normal operation of the coder during "null" destabilization equal to 64 quantization steps both in the positive and in the negative directions.

The protection circuit is a circuit that checks the six higher-order bits of the code group for parity. In the case of an even number of ones in the UZPer in the 53rd position of the cycle, a one is formed; in the case of an odd number, a zero. In addition, in order to decrease the probability of distortion of several symbols of the higher-order bits in one code group, rearrangement of the higher and lower order bits is realized in the UZPer.

In the UZPr reception protection circuit, the 53rd pulse position of the transmission cycle is analyzed, the parity check is performed on the six higher-order bits of the code group, and a decision is made regarding the presence or absence of errors in the received code group. If an error is detected, this code group is not decoded, but is replaced by the preceding one. The application of the protection principle in accordance with the symbol-by-symbol combination of 512 kbits/sec digital flows into a common 2048 kbit/sec flow permits detection of a bundle of error from 1 to 8 in duration and insurance of high-quality transmission over the digital line channels with error coefficient to 10^{-4}.

The codec monitor includes a threshold circuit and digital comparator. On the transmitting side the input analog signal going to the codec input is also fed in parallel to the input of the threshold circuit where it is converted to a single-bit 16 kilohertz train. On the receiving side the received digital signal is compared with the local one, and the decision is made regarding decoding of the basic digital sound broadcast signal according to the comparison results.

The functional assemblies of the KTsV are controlled by the signals from the generator equipment GO and the master oscillator GZ located in the KPVG.

Primary Temporary Group Formation Complex (Figure 6). The structural diagram of the KPVG is presented in Figure 7. Four digital flows formed in accordance with the KKV are combined in the device for shaping the group signal FGS into a digital flow with a speed of 2048 kbits/sec. Here input of a cyclic synchronous signal consisting of alternating combinations of the type of 1111 and 0000 located at the beginning of each cycle is input to the group signal through the synchrosignal shaper FS. The group bindary signal is converted to quasiternary in the PKPer code converter. It is designed for operation in two modes -- the AMI code shaping mode and the HDB-3 code shaping mode. The transition from one mode to the other is made by resoldering the jumpers.

The generator equipment GOPer controls the operation of the junctions of the transmitting part both KPVG and KKV, at the same time insuring synchrony and cophasalness of the operation of both types of equipment. Here the formation of combinations containing a large number of zeros following in a row is possible at the FGS output, which creates an extremely undesirable operating mode for the line generators when forming the AMI code in the PK. In order to eliminate the indicated possibility the group signal from the output of the FGS is converted in the scrambler S, as a result of which quite good approximation of the signal structure at the output of the PKPer to random is insured.

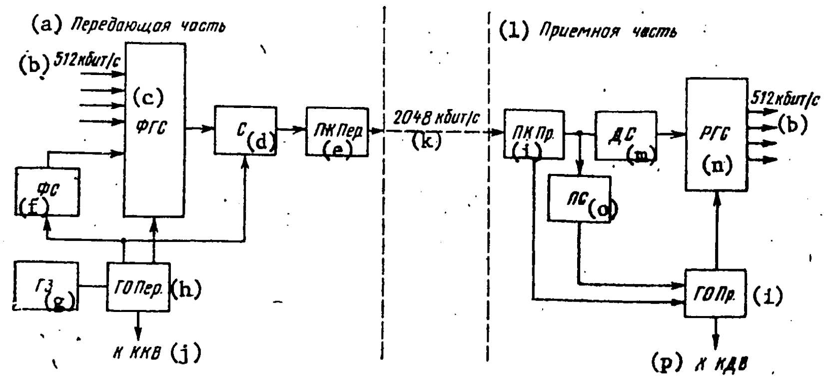

Figure 7.

Key:

a. transmitting part	i. GOPr
b. 512 kbits/sec	j. to the KKV
c. FGS	k. 2048 kbits/sec
d. S	l. receiving part
e. PKPer	m. DS
f. FS	n. RGS
g. GZ	o. PS
h. GOPer	p. to the KDV

In the receiving part of the KPVG, the inverse operations are performed: conversion of the quasiternary signal to binary in the PKPr, restoration of the initial structure of the signal in the descrambler DS, distribution of the group signal in the RGS into four flows with a rate of 512 kbits/sec each. The operation of the enumerated assemblies is controlled by the generator equipment GOPr which also shapes the control trains for the corresponding KDV. In turn, GOPr is set to the initial phase by the synchrosignal receiver PS.

The KPVG uses an adaptive cycle synchronization system in which the storage element for falling out of synch is designed for four errors in a row, and the storage element for putting into synch, is designed for three correct results in a row. However, after the number of errors following in a row exceeds four, the synchronization system does not fall out synch until the storage element before going into synch is filled. In other words, for any frequency of errors, the synchronization system remains in its former state until detection of the new state of synchrony. This insures high noise proofness of both the synchrosignal receiver and all of the digital broadcast equipment.

Basic Electrical Characteristics of the Equipment

Input impedance	600 ohms ± 60 ohms
Output impedance	
primary output	600 ± 60 ohms
auxiliary output	20 ohms
Efficiently transmitted frequency band	50 to 6400 hertz
Overload level	12 decibels
Limits of setting the rated level:	
at the input	0 to 6 decibels
at the auxiliary output	0 to 15 decibels
Residual damping instability	±0.5 decibels
Variation in voltage level with respect to the value measured at a frequency of 800 hertz:	
in the frequency band of 100 to 6000 hertz	±0.5 decibels
in the frequency band of 50 to 100 hertz 6000 to 6400 hertz	+0.5 to -1 decibel

The mean, maximum and minimum values of the sound broadcast signal parameters obtained as a result of measuring the first lot of equipment are presented in Table 2.

Table 2

Name of parameter	Value		
	Minimum	Mean	Maximum
Protection against tsophometric noise, decibels	71	78	82
Signal/noise quantization ratio with signal level, decibels:			
minus 13 decibels	53	54	56
minus 49 decibels	26	29	30
Harmonic nonlinear distortion coefficient, %	0.05	0.15	0.30
Protection against intelligible cross talk, decibels	74	82	85

Equipment Test Results. The experimental models and first lot of series produced equipment were subjected to comprehensive testing, including line, acoustic, experimental and promotional operation at the VII Spartakiad of the peoples of the USSR. The results of the experimental and commercial operation and maintenance indicate the high operating reliability of the equipment.

In order to estimate the quality of the sound broadcast signal transmission, subjective statistical expert examinations of the equipment were performed (by the method of pair listening and the distortion noticeability method).

During the expert examinations, the material was used including dictated and publishing reading sessions, symphonic and popular music, solos on individual musical instruments, and so on.

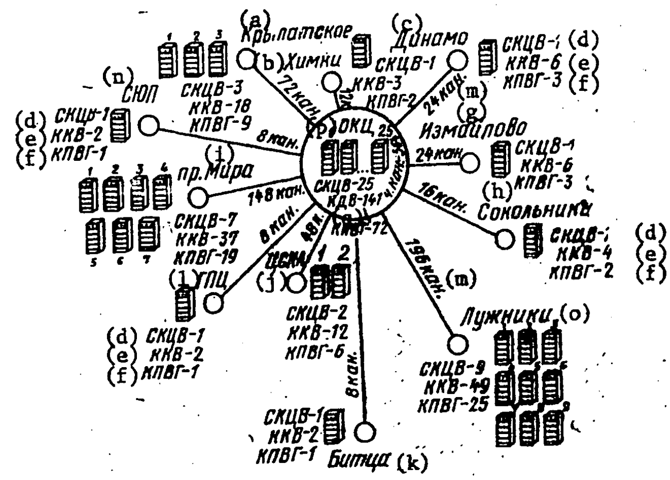

Figure 8.

Key: a. Krylatskoye	g. Izmaypovo	m. ... channels
b. Khimki	h. Sokol'niki	n. SYuP [Young Pioneers' Stadium]
c. Dinamo	i. Mira	o. Luzhniki
d. SkTsV-1	j. TsSKA	p. DKTs-...
e. KKV-...	k. Bittsa	q. KDV-...
f. KLVG-...	l. GPTs	

The results of the acoustic tests demonstrated that the sound broadcast signal transmission over the ATsV signals is realized in practice without distortions by comparison with the standard channel (the preference in favor of the tested channel was demonstrated by 45% of the expert indications).

Conclusions. The results of the development, testing and experimental operation of the ATsV indicate highly economical and effective solution of the problem of organizing the sound broadcast channels.

The digital modulation methods are finding broad application in the sound broadcast program feed and distribution network, for they insure high qualitative indexes of the channels and high operating characteristics of the network. The ATsV will permit solution of the complex problem of organizing large bunches of channels between the sports complexes and the Olympic Switching Center during the first period of the 1980 Olympic Games (Figure 8, GPTs -- Main Press Center, SYuP -- Young Pioneers' Statium).

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VK-960-2 TRANSMISSION SYSTEM

Moscow ELEKTROSVYAZ' in Russian No 7, 1980 pp 10-16

[Article by M. I. Shlyakhter, G. Ye. Yartsev]

[Text] The industry of the Hungarian People's Republic has delivered the set of BK-960-2 transmission system equipment to the USSR to organize trunks between the network junctions and also between the network junctions and the long-distance telephone offices. The equipment is designed to organize 960 voice-frequency channels on small coaxial cable 4 × 1.2/4.6 mm. It is possible to use this equipment on the radio relay lines. At the end of 1979 the Minsk-Baranovichi line equipped with the BK-960-2 system was put into operation.

Basic Parameters of the System. The range of transmitted frequencies in the line channel of 60-4028 kilohertz is formed from 16 secondary groups (VG) (see Figure 1). The frequency intervals for the lower groups with respect to the spectrum (1-2 and 2-3) are 12 kilohertz, and for the rest they are 8 kilohertz. This facilitates isolation of the lower VG from the line channel spectrum. This structure of the spectrum in the BK-960-2 differs from that adopted in the Soviet K-1920, K-2600 multichannel transmission systems. When using the BK-960-2 equipment the through-put from the main lines can be realized by the secondary and primary groups.

The rated length of the repeating section with an average ground temperature of +10° C is 4040 meters with admissible deviation of ±150 meters; the minimum is 0.6 km. In order to compensate for insufficient length of the repeating section to the rated length, artificial lines IL are provided which are equivalent to lengths from 0.3 to 3.3 km in 0.3 km steps. The maximum number of repeating sections in the remote feed section (DP) is 27, and the maximum length of the line channel (LT) is 432 km.

The automatic gain control of the LT is realized using a control frequency current (KCh) — 4287 kilohertz.

The line channel of the BK-960-2 system is equipped with semiattended repeater stations (POUP), that is, the condition of the equipment is monitored by the duty engineers from home. The semiattended repeater stations

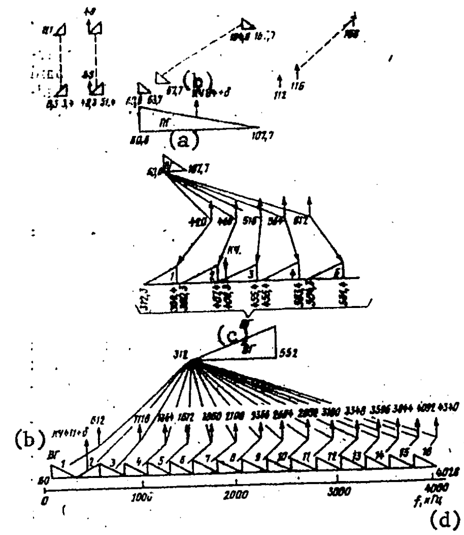

Figure 1.

Key: a. PG = primary groups
b. KCh = control frequency
c. VG = secondary group
d. f, kilohertz

are located between every two attended stations (OS). The length of the controlled section is 216 km, which corresponds between a section between two OS. Consequently, at each OUP [attended repeater station] rereception of the linear KCh current takes place.

The tests of the equipment on an experimental line demonstrated that the electrical parameters of the equipment correspond to the required norms with large safety margin. Therefore an agreement was reached with the developers of the system to lengthen the section between the OS to 204 km with installation of up to 50 NUP [unattended repeater stations] in it. The length of the LT in this case will be 408 km, and there is no further necessity for installing the POUP. The basic parameters of the system at the switching points of the group and line channels are presented in Table 1.

Continuous gain control of the TCh [voice-frequency] channel reception repeater is ±3.0 decibels; the rated gain of the line repeaters on the KCh is 43.5 decibels. The transmission level of the line KCh is -10 decibels. The maximum regulation rate of one line KCh regulator is 1 decibel/sec. The limits of automatic gain control are ±4 decibels. The accuracy of maintaining the KCh current within the given limits on each NUP, OP or OUP is ±0.4 decibels.

The possibility of organizing two-way sound broadcast channels by combining two or three voice-frequency channels and also simultaneous transmission of six sound broadcast programs is insured.

Table 1

Switching point	Rated frequency band, kilohertz	Relative transmission level in channels		Rated input and output impedances, ohms
		Transmission	Reception	
Voice frequency channel	0.3 to 3.4	-13 to -14	+4 to +6	600
Primary group	60-108	-36	-30 or -23	150
Secondary group	312-552	-36	-30 or -23	75
Line channel	60-4028	-33	-33	75

The mean value of the psophometric total noise in the ChNN [peak-load hour] in any voice-frequency channel measured at the point with null relative level, does not exceed 3 pwatts/km. The system is designed for loading the voice-frequency channel with a signal of medium power of 42 mWtOp/channel, which corresponds to a total signal power in the LT of 40 milliwatts. The nonuniformity of the residual distortions of the frequency-amplitude characteristic of the line channel 432 km long after tuning is ±1.5 decibels; after 3 months of operation of the channel without the application of manual equalizers ±4 decibels; with seasonal manual adjustment (4 times a year) ± 1.5 decibels.

The BK-960-2 equipment was developed in two versions: 1) the interaction signals are transmitted over the voice frequency channel (control frequency of the PG is 84.14, and the VG 411.86 kilohertz; 2) the interaction signals are transmitted over a remote signal channel on a frequency of 3825 hertz (control frequencies 84.08 and 411.92 kilohertz).

Automatic gain control is realized using an all-purpose general control frequency receiver PVB. The regulation range of the PVB is ±4 or ±2 decibels. The regulation begins on deviation of the KCh level from the rated by ±0.5 decibels.

In addition to the general PVB receiver for primary groups individual ARU [automatic gain control] receivers for the 84.14 kilohertz KCh for long channels are installed on the TsMK-300 individual conversion frames. Beginning in 1981, the individual receivers will be installed also in the VG channels.

The all-purpose receivers for KCh currents of 84.14 and 411.86 kilohertz and also 84.08 and 411.92 kilohertz receives the entire PG or VG frequency spectrum. At the PVB input there is a 411.86 (411.92) kilohertz frequency conversion unit to 84.14 (84.08) kilohertz frequency. The individual 84.14 KCh current receiver has a converter at the input in which the 84.14

kilohertz KCh is converted by means of the 72.06 kilohertz carrier frequency to a frequency of 12.08 kilohertz.

The service communications are organized with respect to a pupanized quad with conductors 0.7 or 0.9 mm in diameter. The service communication system provides the following: selective calling from any OUP, POUP and OP to nine attended stations by dialing numbers from 1 to 9 using a dial with interruption of the 2100 hertz ringing frequency. Circular ringing from any OP or OUP is realized by dialing the number "zero."

Provision is made for connection of one of two telephone sets installed in the engineers' quarters to the SS channel in the POUP; in the NUP the service communications are provided a portable telephone. Calling the nearest OUP or OP from an NUP is realized by direct current from the SS equipment, and from the OUP to the NUP, voice using a loud speaker system.

The remote control system operates over three symmetric cable pairs and a signal conductor, and it provides for the following:

Transmission of a signal from an NUP in which the KCh level has been reduced by 1 decibel and more, in the direction of station A, over 1 cable pair, and in the direction of station B of the other;

Transmission of an emergency signal from an NUP (opening the cover of a container, a drop in pressure in the cable) over a separate pair;

Transmission of a nonemergency signal from the NUP (lowering the pressure in the tank), over the signal conductor using the ground as the second wire.

The determination of the number of the line channels in which the KCh level has dropped is realized in the NUP by measuring the incandescence currents of the thermistors in the line channel repeaters. The signals from the NUP are transmitted to the adjacent attended stations where the number of the NUP at which the failures occurred is determined.

The remote control equipment in the POUP provides for connection of the sensors of failures in the POUP (opening of a door, a rise in temperature, the appearance of water, burning out of fuses, and so on) to it and relaying of the emergency or nonemergency signals to the adjacent OUP over symmetric pairs and also to one of the engineers's quarters with the possibility of switching to another. The sensors of the POUP failures (in addition to the sensors signalling burning out of fuses, the ARU signal units, the acoustic and optical calling and signal systems regarding damage to the equipment) is not part of the VK-960-2 equipment. Therefore in the engineers's quarters special wall type signal devices are installed.

Electric Power Supply. The terminal and attended intermediate repeater stations can be supplied with 220/127 volt$^{+20\%}_{-15\%}$ alternating current or 24 volts$^{+23\%}_{-15\%}$ or 48 volts$^{+20\%}_{-10\%}$ or 60 volts$^{+20\%}_{-10\%}$ direct current. The voltage at the output of the power supply is stabilized, 21 volts ±2%. The bays are fed by using power packs containing the corresponding converters and voltage stabilizers. The power pack has a power of 300 watts.

It is recommended that the bays be broken down into pairs, and a second reserve unit installed in one of the bays of the given pair. The power system for the bays provides for automatic inclusion of the reserve unit if there is damage to the main unit in one or the other of the bays of the given pair without interruption of power supply. Thus, the bays are fed from one power feeder. The layout of the bays provides for the possibility of feeding them from two feeders, but in this case it is necessary to install two power packs at each bay and have reserve units to replace the damaged ones at the station. The replacement is done manually, with interruption of power.

The unattended repeater stations are fed remotely from a special power supply installed on the line channel bay (YeTK) designed to feed the NUP of one line channel. The remote feed voltage is regulated and is 250 volts for 26 NUP and 1000 volts for 50 NUP. The DP current is 75 ±5 milliamps. The DP circuitry is wire-wire over the central wires of coaxial cables or series included NUP. The DP module also provides auxiliary voltage of 200 volts required to determine the location of a break in the DP circuit.

A portable DP power pack is installed in the complex with the equipment, which is used when deenergizing the repeater section (between two NUP) during the repair operations. The module includes a device for the formation of the loop in the NUP which is in front of the deenergized section. The input parameters of the module are as follows: the feed voltage using 220 volts ±4% with a frequency of 47-61 hertz, maximum intake current 0.8 amps; with 21 volts ±4% dc power supply the maximum intake current is 5 amps. The output parameters of the unit are as follows: stabilized direct current 75 ±5 milliamps; operating voltage 550 volts.

The power intake by the equipment with 24 volts$^{+15\%}_{-10\%}$ dc feed is presented in Table 2.

The BK-960-2 system provides for signalling; a drop in voltage on the bays; KCh level outside the admissible limits; reaching the edge positions by the regulators (recognition of the last two signals is by measuring the levels); a decrease in level of the individual carrier frequencies; switching of equipment to reserve, and so on. Three types of signals are provided: "emergency," "nonemergency" and "reminder." The same signal can be denoted as "emergency" or "nonemergency" depending on the switching in the signal circuit realized on the corresponding subpanel. Any signal can be noted as "reminder," if a shortcircuited plug is connected to the signal circuit. In this case the acoustic signal is disconnected, and the optical signal is kept.

Joint Operation with Radio Relay lines. For organization of communications by radio relay lines the BK-960-2 includes a special panel for matching the

Table 2

Name of equipment	Designation of bay (panel)	Intake power, watts
Bays;		
low-frequency terminals	KhZK-300	190 (200)[1]
individual conversion bays	TsMK-300	440 (540)[1]
Subpanels:		
individual converters	TsMK-12	14.0
12/60-5A primary converters	GMV-12/50-5A	47.0
12/60-5V primary converters	GMV-12/60-5V	27.0
systems converters	RMB-60/960	63.0
junction generating equipment	MOB-960	63.0
generator equipment of the carrier and control frequencies	VPB	25.0
repeater subchannel of the control frequencies	VYeB	47.0
generator equipment -- 1552	PYeB-1552	18.0
KCh 84.../411... receiver	PVB-84.../411...	17.0
KCh 1552 receiver	PVB-1552	17
line repeaters	VYe	10.5
line termination	VVB	9.5
coupling to radio relay line	VTsB	4.5
meter and PVU	ShMB-12	12
corrector	MKB	1.5
group isolation	LYeB	3.5
secondary group through-put	TShB-ShG	3.0
service communications channel (PSS)	ShB-1	19.0
determination of the location of the damage	KhB	7.5
DP module	TTYe	115
Auxiliary power pack	ShTYe	26.5

[1] The intake power in volt amperes is indicated in parentheses when supplying 220 volts of ac power.

LT levels of the BK-960-2 with the radio relay levels. The panel is installed on the YeTK line channel bay. In addition, in the equipment provision is made for an additional KC 1552 kilohertz for through monitoring of the combined line channels.

Structural Design. The BK-960-2 is made in the form of a prefabricated subpanel design. The subpanels are placed on a standard frame and are connected to the bay installation by a plug-in connection; the units combining the printed plates are connected by means of plugs in the rear of the subpanels. The following bays constitute an exception: end, cable entrance equipment, VCH [high-frequency] switching and low-frequency KhZK terminal bays which are executed on a special frame with rigid installation of the modules.

It is possible to put up to 19 subpanels in single-row execution 137 mm high on the standard frame. The TsMK-300 bay is an exception, the subpanels of which have a height of 141 mm. The subpanels installed on the bays can be single-row, two-row and four-row. Each frame has a power distribution and protection panel.

On the left-hand part of the frame is a shaft for running the bay and inter-bay (station) installation cables; in the right-hand part are the feed, signal, carrier and control frequency distribution circuits. The frame is assembled at the equipment installation point.

The NUP is structurally a sealed container designed for three 960-channel transmission systems. It is made of a steel tube covered with special insulation for corrosion protection. The container is installed directly in the ground and is maintained under excess air pressure. The NUP container is equipped with stub cables 5 meters long for connection to the line cable (see Figure 2).

The line repeaters of the NUP, OUP and OP are executed in the form of aluminum cylinders sealed by means of a seal. The cylinder dimensions are 640 × 100 mm.

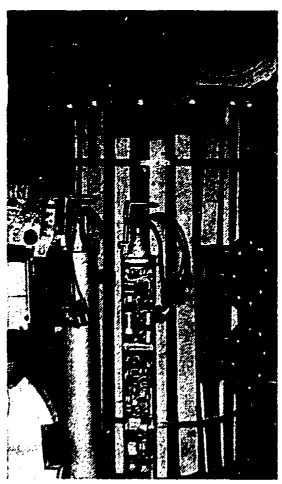

Figure 2.

The overall dimensions of the BK-960-2 equipment are as follows: the primary bays have dimensions of 2600 × 600 × 235 mm; the cable entrance equipment bay is 2600 × 485 × 235 mm; the switching bay is 2600 × 620 × 230 mm; the end bays are 2600 × 435 × 233 mm. The NUP container has a diameter of 595 mm and a height of 1178 mm.

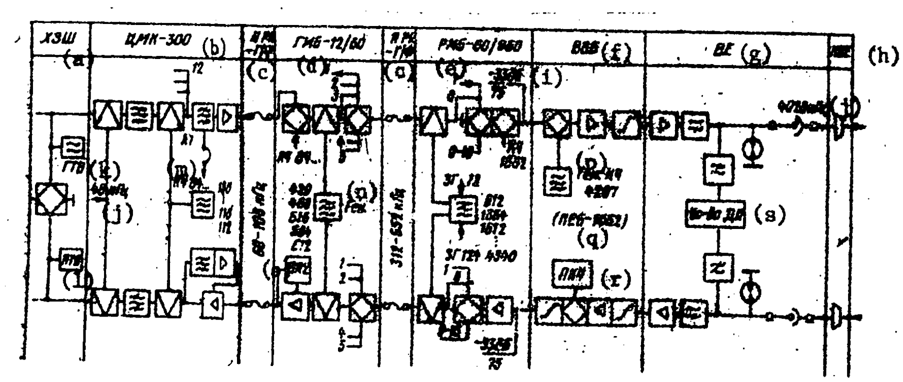

Figure 3.

Key:

a. KhZSh	g. VYe	m. KCh...
b. TsMK-300	h. KVYe	n. generator
c. NRK-G/F	i. -33 decibels	o. PK...
d. GMB-12/60	j. kilohertz	p. generator of KCh...
e. RMB-60/960	k. GTV	q. (PYeB-...)
f. VVB	l. PTV	r. PKCh
		s. DP circuitry

Climatic Operating Conditions. The equipment of the terminal and the attended repeater stations is designed for operation at an ambient temperature of +5 to 40° C and relative humidity of 80% with a temperature of +25°C; the NUP equipment is designed for a temperature of -10 to +40° C and short term, but no more than 2 months a year, with relative humidity of no more than 98% at a temperature of +35° C.

Composition and Capacity of the OP and the OUP equipment are presented in Table 3. The structural diagram of the terminal station is presented in Figure 3.

The unattended repeater station NUP (NBK) includes line repeaters to compensate for the damping of the repeater sections adjacent to the NUP and also the following devices: for gain control with respect to the KCh, remote servicing from the OUP, connection to the SS with the NUP closed, monitoring the opening of the cover of the NUP container. For conversations from the NUP a portable telephone is included in its equipment.

The composition of the POUP equipment differs from the equipment of the attended stations by the presence of signal reception devices installed in the engineers' quarters.

Purpose of the Equipment Bays. The KhZK-300 low-frequency terminal bay is designed for 300 voice frequency sets and contains the following; voice-frequency ringing generators receivers on frequencies of 2100, 2280 or 2600 hertz, PVU and level meter.

Table 3

Equipment	Code	Number of bays and so on, pieces		Maximum capacity of the bay
		OP	OUP	
Cable entrance	KVYe	1	1	3 cables
Low frequency terminals	KhZK-300	Determined when designing	--	300 joules
Individual conversion	TsMK-300	4	--	300 channels
Primary conversion	GMK-12/60	Determined during design process	--	600 channels[1]
Secondary(system) conversion	RMK-60/960	1	--	960 channels
Generator	MOK-960	1	--	960×2 channels
Line channel	YeTK OP/OUP	1	2	960 channels
End bay	ShLK	1	1	the same
Switching of the group channels	NRK	1	--	the same
Portable repeater for formation of slaved PG and VG	Portable repeater	1	--	--
Portable telephone set	ShZT	1	1	--
Portable DP module	--	1	1	--

[1]The rest of the primary conversion equipment using 360 channels is placed in the secondary conversion bay.

On the TsMK-300 individual conversion bay(Figure 4), in addition to the permanent equipment (power pack, feed distribution and protection subpanels), there is individual conversion equipment -- channel modules, PG modules, devices for KCh current input and output, band-elimination filters, individual KCh receivers, generator equipment, PVU and level gage.

The channel modules are executed in three versions: with a device for transmission or reception of ringing in the channel band, with analogous devices for reception and ringing outside the channel (on a frequency of 3825 hertz) and without the indicated devices.

The level meter generator has the following frequencies: 0.3, 0.4, 0.6, 0.8, 1.0, 1.4, 2.0, 2.4, 3.0 and 3.4 kilohertz and levels of 0, -10, -14, -24 decibels. The level meter is wideband (0.3 to 150 kilohertz), measurement limits from +20 to -40 decibels. The input impedance is 600, 150 ohms or high-resistance. The generator equipment generates the following: 48 kilohertz carrier frequency, individual carriers on auxiliary frequencies of

72.06 (72) kilohertz and 12.08 kilohertz for obtaining KCh 84.14 (84.08) kilohertz. All of the enumerated frequencies are generated by the 8 kilohertz harmonic generator by corresponding multiplication, division and conversion of the harmonics. The generator is fed from the master oscillator located on the same subpanel or on the outer control frequency.

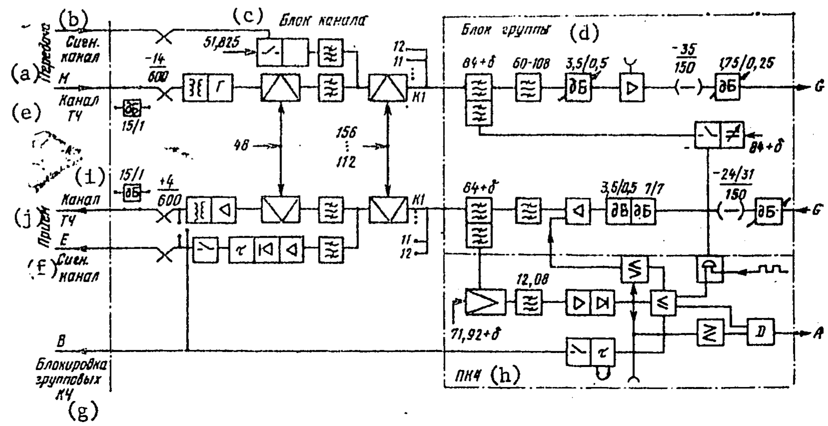

Figure 4.

Key:
- a. transmission
- b. signal channel
- c. channel module
- d. group module
- e. TCh [voice frequency] channel
- f. signal channel
- g. blocking of group KCh
- h. PK...
- i. channel
- j. reception

On the subpanel there are two sets of generator equipment: basic and reserve; switching from basic to reserve is automatic, and the switching time is 15 seconds.

The TsMK-300 panel is designed for operation both in the BK-960-2 system and in the transmission systems of another type. The weight of the bay is 375 kg.

GMK-12/60 Primary Conversion Bay. In this bay we have the following: two sets of subpanels of the primary converters (25PG to 5 VG) and the subpanel of the universal receiver of the KCh 84.14 (84.08) and 411.86 (411.92) kilohertz current (VPB).

Each primary conversion set is madeup of two subpanels; basic (GMB-12/60-5A) containing the 15 PG to 3 VG conversion equipment and generator equipment, and auxiliary (GMB-12/60-5V) containing the primary 10 PG to 2 VG conversion equipment. The additional subpanel is used only together with the basic subpanel.

The generator equipment generates the carrier frequencies of the primary groups: 420, 460, 504, 516, 612 kilohertz, formed using the 12 kilohertz harmonic generator, narrow-band filters, repeaters, multipliers and frequency dividers. The generator equipment of the GMK-12/60 bay has no reserve.

In the GMK-12/60 bay there is equipment for 600 channels. In order to insure complete equipment of the BK-960-2 system, it is recommended that the two GMB-12/60-5A subpanels for the remaining 6 VG placed in the RMK-60/960 secondary conversion bay. Here they will be serviced by one KCh receiver together with the secondary groups. The bay weighs 280 kg.

RMK-60/960 Secondary (System) Conversion Bay. This bay contains the following: the RMB-60/960 secondary (system) conversion subpanel, the standardized KCh 411.86 (411.92) and 84.14 and (84.08) kilohertz standardized current receiver subpanel (VPB) and if necessary the KCh 1552 kilohertz (PYeB) current receiver subpanel. In addition, subpanels of the GMB-12/60-5A primary converters can be placed in the bay.

The generator equipment located on the secondary converter subpanel generates 15 VG carrier frequencies: 612, 1116, 1364, 1612, 1860, 2108, 2356, 2604, 2859, 3100, 3348, 3596, 3844, 4092 and 4340 kilohertz using the 12 and 24 kilohtertz harmonic generators fed control frequencies from the MOK-960-2 bay. The RMK-60/960 bay weighs 300 kg.

MOK-960-2 Generator Equipment Bay. On this bay, in addition to the three subpanels of the MOB-960 master generating equipment, depending on the request, there can be subpanels of control and monitoring frequency repeaters VYeB, frequency distribution FYeB and KCh 1552 kilohertz generator. The generator equipment generates control frequencies of 12 and 124 kilohertz; the monitor frequencies are 84.14 (84.08), 411.86 (411.92) kilohertz and comparison frequency of 60 kilohertz emphasized from the 1488 kilohertz quartz oscillator signal with high stability. The schematic of the frequency equipment in the MOB-960 subpanel is presented in Figure 5.

The subpanel contains one operating and one reserve complex with automatic switching from the basic complex to the reserve. The switching time is 4 milliseconds. The switching takes place with a level drop by 2-3 decibels. In the subpanel there is a module for observing the KCh levels, which generates a signal on variation of the level by ± 0.5 decibels. The subpanel provides power for the two BK-960-2 systems.

The generator equipment includes the circuitry for comparing the 60 and 308 kilohertz frequencies with the standard frequencies. The frequency of the master oscillator is 1488 kilohertz, and the external controlling frequencies are 60 or 372 kilohertz. The subpanel of the master oscillator includes a level meter in the frequency range of 12 kilohertz to 12 megahertz with measurement limits from -35 to +1.5 decibels.

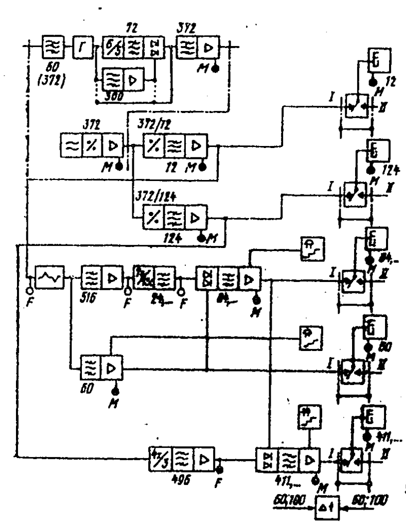

Figure 5.

The subpanel of the master oscillator has 12 outputs for each control and monitoring frequency, five outputs for comparison frequency and can feed the VK-960-2 equipment directly with a transmission level at the output of 0 decibels. If the indicated number of outputs is insufficient, a subpanel is installed on the MOK bay to distribute the controlling and the monitoring frequencies of the FYeB in which the frequencies are distributed with respect to 10 directions with a level of 0 decibels. In the large LATs, it is possible to feed the controlling and monitoring frequencies through the distributors in the end bay (ShLK). In this case, on the MOK bay using the subpanel of the controlling and monitoring frequency repeaters VYeB, an ouput level of +15 decibels is insured. The bay weighs 200 kg.

The YeTK-960 line channel bay is analogous with respect to its purpose and equipment to the SLUK bays of Soviet transmission system equipment and the VLB bay for the VLT-1920 equipment. The bay includes the following: the line repeater subpanels for two VYe systems, the two line termination subpanels VVB for one system, two remote feed units for one TTYe system and also the ShV-1 service communications subpanels, subpanel for determination of the location of damage to the KhB line, manual adjustment of the equalization of the frequency-amplitude characteristic of the line channel BKM. In addition, the subpanel for isolation of the secondary LYeB groups can be installed on the YeTK. For operation of the YeTK on a radio relay line or on a combined line there is also a subpanel for coupling to the radio relay line VTsB for matching the LT levels of the BK-960-2 with the radio relay line.

The VVB line termination subpanel contains a generator and line KCh 4287 kilohertz current receiver; input, output and suppression circuits for the line KCh; prediction circuitry; a corrector for equalizing the nonsystematic distortions of the line channel; station wiring correctors. The VVB subpanel has equipment versions for OP and OUP. In the version for the OUP, automatic inclusion of the KCh 4287 kilohertz generator is provided for feeding the KCh current to the line channel section in a state of good repair.

The subpanel for determining the location of the damage to the KhB line includes a bridge for measuring the resistance of the symmetric pairs used for remote control.

On the subpanels for the line repeaters VYe there are four repeaters which are identical with respect to circuitry and structure both for the attended stations and for the NUP. The YeTK bay at the terminal stations provides for inclusion of two line channels, and at the OUP, one. The bay weighs 250 kg.

The KVYe-960 cable entrance equipment bay is designed for inclusion of three line cables which are introduced from the top or the bottom (the version is stipulated in the order). The bay is delivered with stubs 5 meters long terminating in cable heads. The symmetric quads are led out using a flexible cable 2 meters long equipped with a connector for connection to the discharger plates.

The structural design of the cable head arise for maintenance and checking of excess air pressure in the cable by a special valve.

The lightning protection of the symmetric pairs is provided by gas-filled dischargers connected between the conductors and ground. The dischargers (40 of them) are placed in the KVYe, on special plates. The breakdown voltage of the gas-filled discharges is as follows: for the symmetric pairs 400 $\pm$50 volts; for the coaxial pairs 750 $\pm$150 volts.

The bay weighs 210 kg.

When installing the cable entrance equipment bays in the LATs of the large communication junctions difficulties arise in feeding the line cables, the conduits for keeping the cables under excess air pressure to them.

The ShLK terminal bay is designed for introduction, distribution and protection of the feed voltage of the equipment using automatic breakers, acoustic and output signals, distribution of the carrier and monitored frequencies PG and VG and also for supplying power to the hand tools and measuring instruments on 220 and 24 volts.

When ordering, the following are stipulated: the number of frequency distribution modules, the number of automatic dc and ac switches and maximum loads; the number of signal modules or connected bays; the necessity for a power pack (rectifier).

The bay weighs 120 kg.

The group channel switching bay NRK is designed for switching the transmission and receiving voltages of the primary and secondary groups. The cross talk attenuation between any channels in the entire frequency range is more than 100 decibels. In one bay there is a maximum of 10 switching panels. The bay weighs 80 kg.

The switching panel is made in two versions: 1) with symmetric plugs (for primary groups); number of plugs 2 × 25 (25 pairs); 2) with coaxial plugs (for secondary groups). Number of plugs 2 × 18 (18 pairs). The design of the plugs provides for threaded connections. The symmetric plugs are designed for banana plugs.

The bay can be outfitted with arbitrary combination of panels within the limits of its capacity. Two versions of equipping the bay have been agreed upon: version A with 5 panels with symmetric and 5 panels with coaxial jacks; version B with 7 panels with symmetric and 3 panels with coaxial jacks. The switching is done by flexible cables.

The industry of the Hungarian People's Republic has developed a version of the NRK bay with a set of attenuators to compensate for the attenuation of the station wiring. The set consists of 0.15, 0.5 and 1.0 decibel attenuators connected by resoldering. The capacity of the panels of both switching types decreases to 12 pairs of jacks. The attenuators to compensate for the attenuation of the station wiring are now located on the corresponding panels of the TsMK, GMK and RMK bays.

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FRANCE

NEW DATA COMMUNICATIONS COMPANY HEAD INTERVIEWED

Paris ZERO UN INFORMATIQUE in French Aug-Sep 80 pp 170-178

[Interview with Yvon Le Bars, president and chairman of the board of the Transpac corporation, by Patricia Poupaert--date and place unknown]

[Text] [Question] Transpac nominally went into operation at the end of '78 and really took off in March 1979 with the official inauguration by the secretary of state for posts and telecommunications.

At mid-year 1980, how are things going really?

[Answer] 18 months after the inauguration of commercial service, which really took place in December 1978, it can be considered that Transpac is well on its way, since its objectives have presently been attained, even surpassed.

I will cite two examples: on the commercial side, at the end of May 1980, we recorded 2,650 orders for direct access hook-ups to Transpac; on the utilization side, we have more than 1,600 hook-ups in service, of which 1,340 are direct access and the rest through telephonic or telex access.

Triple Present Capacity by 1981

[Question] How many potential subscribers can you carry now with this first phase of equipment?

[Answer] As you know, the network in phase 1 was designed with 12 commutators that were installed in 1979. This first phase corresponded to a capacity of 1,500 subscribers.

[Question] Which is already surpassed!

[Answer] Precisely, and this is why, taking into account of the commercial prospects clearly shown in 1979, we have programmed a major increase in capacity for 1980, since we have decided to triple present capacity by the beginning of 1981.

[Question] That's ambitious!

[Answer] We are in the process of realizing this, through two kinds of actions: first the expansion of the first twelve sites, which was accomplished at the beginning of 1980, which gives the network an installation capacity at present of close to 3,300 hook-ups.

[Question] What do you call expansion?

[Answer] This is the addition of a certain number of resources to the existing commutators, and, for the biggest centers, putting in several commutation modules. A Transpac center originally consists of a commutation module (CP-50) and the equipment necessary to accommodate around 500 hook-ups. In Paris we have had to triple [the capacity of] this installation and to use three modules. The second way we can triple capacity is putting new sites in operation. This is going to take place gradually through the second half of 1980.

Seven new commutators are anticipated: Paris 2 (Beaujon), Corbeil, Reims, Nancy, Renoble, Montpellier, and Poitiers. So, starting in early 1981, we will have a clearly more powerful network and one with stronger links; starting from this base, it will then be possible for us to accomplish major expansion of capacity.

[Question] What is the design capacity of the seven new commutators?

[Answer] At first, we can accommodate 4,500 hook-ups, but their potential is much greater. We are gradually going to enlarge the commutators, as we did in April with Paris 1 and install several modules on each site according to its needs. We have already ordered expansion to 6,900 subscribers and we are making preparations for the next phase: at least 10,000 hook-ups.

What Customers for Transpac?

[Question] How are the users divided according to economic sector?

[Answer] It is very interesting to note a quite broad spread of Transpac utilization among the extremely varied sectors of the economy: administration represents 13 percent of the hook-ups; banking and insurance 31 percent (but only 10 percent of the number of customers, for these are often big users); the sector of industry, trade, and services makes a healthy dent with 43 percent of hook-ups and 64 percent of customers: thus there are a huge number of enterprises, private or public, middle-sized or large, that are beginning to link up their primary establishments through Transpac.

The SSCI [expansion unknown] account for 12 percent, and the liberal professions for 10 percent (but in number of customers the latter are only 6-1/2 percent, a figure which is becoming significant). We estimate that 28 percent of present Transpac customers are PME's [small and medium-sized businesses]: this seems to us to be a good beginning and we conclude that demand from this kind of enterprise is not going to quit growing.

[Question] Are the data-processing [equipment] manufacturers included in the figures for the industrial sector?

[Answer] Yes, but their share is down from the time in the early days when they were doing intensive testing. So, from the statistical point of view, we have grouped them with the rest of the industrial sector.

[Question] Do you vary your sales approach according to the different size of the corporate customer?

[Answer] We have the direct activity of our sales leadership, but we have also sought to utilize to the maximum extent possible relays such as for example the telecommunications services...

[Question] There has been talk of tele-boutiques...

[Answer] The regional telecommunications services are in the process of reorganization, along the lines of telematics. We are working with the various services that are concerned with telematics and these are special correspondents for us.

Both the SSCI and the manufacturers of data processing equipment are good relays, because dialog with the customer is often a three-sided dialog.

We have also participated in many advertising and promotion campaigns in the provinces, either with Telecommunications, or associations for the development of data processing which exist now in all the regions.

Manufacturers Are Joining Together More and More

[Question] Statistics have been put out on the specific kinds of hook-ups: black boxes or interfaces integrated with the manufacturer's equipment: is this progress?

[Answer] The latest statistics show that 75 percent of hook-ups are real-time and thus respect the famous X-25 norm, 25 percent thus involve access (non-synchronous, compatible with Teletype or Telex) regulated by the PAD [expansion unknown] system which, through the automatic assemblage and deassemblage of packets, assures to the user an adaptation without further problems.

For the real-time hook-ups, close to 70 percent of computers today make use of an X-25 integrated interface, frontal equipment, or intelligent regulator.

[Question] Most of the central units thus now have an integrated interface?

[Answer] 70 percent is what we have today. There has been, in this field, a gradual increase during recent months, and that should continue.

What is certain, is that the variety of data processing equipment that is connectable to Transpac is continually growing rapidly. At the beginning of June, we published a list of this equipment: almost all the manufacturers are on it... This is a position in which we take a great deal of satisfaction.

The voluntarist option of adopting the X-25 international standard, and to impose it on all real-time [activity], the effort to adapt to this norm, has been a costly choice. Moreover, the manufacturers having adopted this international standard and adapted their equipment to it, has resulted in passing in achieving some exportability.

[Question] What have been the most significant developments since 1979? A year is a very long period for a new project, and the users are quite concerned!

[Answer] Exactly right! At IBM there was the connection of the big diffusion systems: the 34, 38 and 8100 [systems], to the 370's and the various terminals.

At CII-HB it is the integration, since 1979, of X-25 into the DSA [expansion unknown] design (on the 64, 66, the mini-6...) and in April 1980 the arrival of the Questar terminals with integrated X-25.

Burroughs, ITT with its IBM compabilite [translation unknown]--SNA via Transpac, DEC accommodating X-25 on the PDP-11, and VAX in the Decnet framework, ICL with the 2900's and the 7500 terminals, Data General with a Zodiac design based on X-25 as a transport protocol, and Prime which is extending X-25 to all its mini's...

The variety of programs tolerated by the converters is also very interesting to note, for example Sit-Intel or Tit which have improved their ability to connect with numerous products, including the Videotex terminals.

Growing Pain "Incidents"

[Question] Transpac has become a reality. Do you think, however, that the product is really responsive enough to justify a public network of packet [sic] transmission. There are rumors of problems with response time, with hook-ups. It is hard to keep speaking still of start-up problems.

[Answer] Transpac has experienced a phase of very rapid take-off. We have been forced to master very quickly the various aspects of management of a network of this type, as much commercially, as technically. We had to put in place the first 12 utilization centers with their personnel to be trained, and organize the maintenance.

Our present new hook-up capacity is on the order of 200 per month, a figure comparable to our production plan. There were real problems of delays in hook-ups, in Paris especially, before the expansion of the center: but these delays have now disappeared.

And, too, a fundamental subject, there is the problem of the quality of the service we offer to our users. It is true that we have experienced a certain number of start-up problems, which I would put into two categories.

Last November, we ran into the case of customers with programs or procedures that produced incidents on the network: the system was not sufficiently well protected against certain abnormal user activities. We have examined these cases.

[Question] What was happening in fact?

[Answer] In most cases a basculement sur la chaine de secours [translation unknown] but, sometimes, too, a short down-time necessitating a restart-up of the system. We have tried to identify abnormal activities, we have asked our customers to correct them and we have added the necessary security [measures] at Transpac to make sure that it does not happen again.

The other kind of incident is related to the expansion of the network. In March-April 1980 a flaw in the software appeared during the expansion of the network. Here again the anomaly was identified and the corrective action taken. I think this kind of problem is not unusual for a complex and totally new data processing system.

Our people have acquired, with this growth in power and the various problems encountered, a high level of technical mastery which should enable them to handle the future development of the network capably.

[Question] How many people do you presently employ?

[Answer] Precisely 161 people today. We are in line with what was anticipated: 45 people in Paris, 50 at Rennes, and the rest in our utilization and maintenance centers.

In Paris, there is the board of directors and the top people in sales, finance, and administration.

At Rennes, we have the top technical people and those responsible for utilization.

In the centers, there are 3 to 10 people on each site.

[Question] The possibility has been mentioned of guarantees on Transpac service and of penalties in case of non-compliance with contractual services. Do you think this approach is realistic?

[Answer] We have already introduced into our service contract a penalty relative to non-compliance on hook-up deadlines. This is a first step.

As to [rate] abatements for inadequacies in the quality of service, this remains our intention: we have to continue our research and our calculations, for we do not yet have a sufficiently long data base. We must also understand the exact needs of the customers, who themselves need a rather long period of observation and who have extremely varied applications.

[Question] How do you see the role of the SSCI in relation to Transpac?

[Answer] We have wanted to have regular relations with them because we have common customers, especially with those involved in teleprocessing. We are preparing to publish an annual yearbook on SSCI services as well as of data banks available via Transpac.

A Consistent Tariff Policy...

[Question] Has there been a change in tariff policy?

[Answer] The question is important: the tariffs published in Sicob 78 were not modified in 1979 and I can tell you today they will not be [modified] in 1980. The good start Transpac has made will thus benefit its first users.

[Question] A consistent tariff policy is one of Transpac's major concerns. All your potential customers pose the question of profitability.

[Answer] The calculation is simple to make. The level of tariffs compared to the costs of private networks speaks for itself in the great majority of cases!

[Question] What has become of Utipac, about which one does not hear much talk anymore?

[Answer] Created in 1979 by the former members of Gerpac (there were 15 of them), this association was to be open to any new user. A dozen new enterprises have since become shareholders of Utipac. Many connections are in progress. Utipac has thus made a good beginning.

Utipac is both an association of users in concertation with Transpac, and a company participating in the capital of Transpac. This unique structure functions well, in our opinion, and permits the structuring of concertation between Transpac and the users. We would like to see as many users of Transpac as possible enter into Utipac.

[Question] You have provided for training at Transpac. Do you handle this yourselves?

[Answer] Absolutely. We think this training is necessary, and besides, the requests from enterprises confirms our feeling.

We have developed three kinds of courses: an introduction (1 day), utilization (3 days), and hook-up (5 days), both for clients and prospective clients, as well as for manufacturers of materials. These courses have been quite successful.

Transpac and Telematics

[Question] What are the growth markets for Transpac looking at 1985, in the context of telematics, Videotex, Teletel?

[Answer] We are excited about this prospect right from the start. Transpac seems to us to be a really good network for transport of some of these new products and this for several reasons: Transpac exists, its network covers the entire territory, its rates are attractive, and its personnel are competent.

We have made experiments of bureautique [translation unknown] for our own needs, our own network, and we have concluded that utilization of Transpac would permit very good functioning of text-processing machines among themselves, or with teletypes, computers, or data banks. We wish to design full-scale experiments with a certain number of big enterprises that improve tele-bureautique [translation unknown] solutions.

Regarding Videotex, Transpac is not necessary for local connections, but for long distance hook-ups, we think that the role of Transpac can be important.

As to the relay of messages, we ourselves are conducting the first studies, for we think that here is a service which could usefully complete our basic services.

[Question] There is talk of a new Transpac generation for 1982. What is that all about?

[Answer] We are studying improvements in the materials of the network, and are considering, in fact, smaller systems than the present ones, to increase our geographic coverage. Present technology also allows us to think of smaller commutators that perform better, based on 16-bit microprocessors, and permit the introduction of the new facilities indispensable to the new services we want to put in place.

We have in fact asked DGT [expansion unknown] to begin consultations. We are expecting responses in mid-July and predict a decision between now and the end of the year.

We also think that this new material will be in a good position to be exported for networks of medium size.

International Possibilities

[Question] At present, is any Transpac activity oriented toward exportation?

[Answer] First, we must have the international connections.

[Question] Euronet, Tymnet...Telenet were symbolic beginnings?

[Answer] Absolutely not. There was a testing period, then the commercial opening in December '79 with Telenet and Tymnet, and in February with Euronet. We are studying new links with Spain, Japan, Canada, and other European countries, as they put in place their own national networks.

We also want to promote the commercialization of French hardware and software abroad. Don't forget that it is French industry (a consortium headed by SESA [expansion unknown]) that created Transpac and Euronet. We are helping promote Transpac and French technology in collaboration with Telecommunications (expositions, working groups, etc.).

In Rio de Janeiro, at Intelcom 80 we presented connections via satellite and Transpac using computers, data banks, and Teletel slaves located in France. We have done this in the past in China and Mexico.

The adoption of packet communication is continually expanding: Belgium, Great Britain, the Netherlands, Germany...

Mexico and Brazil have put out bids. This should result in real international service thanks to the progressive interconnection of these diverse networks. Commutation by packets is truly the best option.

[Question] What do you think of Telecom 1?

[Answer] An excellent initiative, taking into account the experience of France in satellite technology and the importance of space applications. Enterprises will thus have huge numerical markets for new services such as the video conference or rapid transfer of card-indexes.

[Question] A competition, then?

[Answer] A complementarity, rather, but with a zone of overlap. It is healthy that users can choose between various solutions. We ourselves are studying utilization of Telecom 1 as a link between certain nodal points of Transpac...

[Question] Who Are You, Yvon Le Bars?

[Answer] After my studies at the Ecole Polytechnique and at the Mining College in Paris, I began my career in the ministry of industry in the field of heavy industry, as an engineer, then as chief of economic and financial services in the directorate of iron and steel industries, next as deputy director of metallurgical industries.

In 1972 I went to the Delegation for Territorial Development and Regional Action--DATAR--to work on industrial decentralization and conversion of problem areas.

In February 1974 I was called as technical counselor to the office of the prime minister where I was responsible for industrial problems, as well as problems of territorial development and posts and telecommunications.

In October 1976 I joined the staff of the secretary of state for posts and telecommunications as deputy director, then as chief of staff. And, in March 1978 I became president-chairman of the board of the Transpac firm at the time of the creation of this firm and with a view toward opening up this new network of data transmission.

[Begin boldface] Forty-one years old, the father of two children, Yvon Le Bars is chief engineer of mines, and a diplomate in economic sciences. He is an officer of the National Order of Merit.

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